Assessing Educational Outcomes in an On-Line Class

Summary of Original Proposal

William Bianco (Political Science)

This research compares educational outcomes in traditional and on-line versions of a popular political science class, Introduction to American Government. This comparison addresses a fundamental question about on-line classes: do students learn as much (or more) from these classes as they do in classes that meet face-to-face? The findings contribute to the wider debate over the value of on-line classes. They also provide vital information for discussions within the Political Science department and throughout campus about increasing the number of on-line classes.

The analysis uses a field experiment, where the same course content (including an e-text delivered via Courseload) and examinations are used for traditional and on-line classes taught in spring semester and summer session, and multiple regression analysis is used to assess the impact of course format on education outcomes at the margin of other factors such as baseline knowledge. Preliminary findings suggest that the on-line format is a significant negative influence on student learning. The research proposed here will document this finding and implement changes designed to mitigate it.
Assessing Educational Outcomes In An On-Line Class

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Abstract

This research compares educational outcomes in traditional and on-line versions of a popular political science class, Introduction to American Government. This comparison addresses a fundamental question about on-line classes: do students learn as much (or more) from these classes as they do in classes that meet face-to-face? The findings contribute to the wider debate over the value of on-line classes. They also provide vital information for discussions within the Political Science department and throughout campus about increasing the number of on-line classes. The analysis uses a field experiment, where the same course content (including an e-text delivered via Courseload) and examinations are used for traditional and on-line classes taught in spring semester and summer session, and multiple regression analysis is used to assess the impact of course format on education outcomes at the margin of other factors such as baseline knowledge. Preliminary findings suggest that the on-line format is a significant negative influence on student learning. The research proposed here will document this finding and implement changes designed to mitigate it.
The central goal of this proposal is to compare educational outcomes in traditional and online versions of a popular political science class, Introduction to American Government. This comparison is addresses a fundamental question about online classes: do students learn as much (or more) from these classes as they do in classes that meet face-to-face? And if differences exist, can they be mitigated?

This research aims at the debate over the efficacy of online classes. While there has been much discussion of various online instructional technologies and the normative implications of moving to online instruction, very little attention has focused on actual educational outcomes. Within the limits of this study (a particular course, instructor, and implementation of online technology), that is exactly what I propose to do.

A second and equally important goal is to improve the Political Science department’s course offerings. Currently Intro is offered three times during the academic year, accounting for over a quarter of POLS enrollments. Discussions have centered on offering an online version during the summer session, and to advertise widely in order to attract would-be transfers students at other IU campuses, and, potentially, students throughout the US. Before making this step, it is critical to determine what students get from the online class – particularly given the course is a prerequisite for many classes in political science and is required for several other majors on campus.

The core of this project is a field experiment where the same course content (including an e-text delivered via Courseload) and examinations are used for traditional and online classes. Half of the research has been completed: during Spring and Summer 2013, I taught the Intro class three times: once as a large sectioned class, once as a small lecture, and once online. The three classes had essentially the same content, instructional materials, and exams. In effect, everything was held constant except the method of instruction, allowing exam scores to be used as direct comparison of educational outcomes (results are presented later). The most important finding from initial analysis is that student performance in the online class lagged behind performance in semester and summer classes taught face-to-face. Moreover, the effect is quite substantial compared to other factors affecting student performance.

This proposal seeks funds for three additional steps. One is to add student information to the analysis to control for other influences on educational outcomes, most notably student interest/effort. The second is to move beyond the current focus on multiple-choice questions to consider performance on short essays. Moreover, since I am scheduled to teach Intro again during Spring 2014 and in Summer 2014 as an online class, I will alter the structure of the online class to improve student performance, and add outcome data from both of these classes into the analysis.¹

**Intro American Government: Three Implementations**

The central premise in my Intro class is that nothing in politics happens by accident, that outcomes are the result of the choices people make. The primary goal is to understand American politics by examining these choices and their consequences. The secondary

¹ At present, I am scheduled to teach Intro twice during Spring – Summer 2014. I am in discussions with my Chair and the Dean’s office over teaching it a third time as a lecture class during Summer 2014, to understand whether the effects seen during the online class are the result of timing (summer) or format.
emphasis is on facts, both to provide basic information about American politics and to demonstrate that there is evidence behind the theories and arguments presented in the class. The class is ruthlessly contemporary, emphasizing the political issues, campaigns, and controversies that are part of students’ everyday life. In all of these aspects, the class is intended as a gateway to the Political Science major, providing skills such as chart-reading that are essential for more advanced classes.  

The three-class sequence of Intro courses that I taught last year (and the two additional classes in Spring and Summer 2014) are designed to measure the impact of different methods of instruction by keeping course content and examination content constant and manipulating the variable of interest, the type of class. The following table summarizes the similarities and differences between the classes:

<table>
<thead>
<tr>
<th></th>
<th>Semester Lecture</th>
<th>Summer Lecture</th>
<th>Summer On-line</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration</td>
<td>14 weeks</td>
<td>4 weeks</td>
<td>4 weeks</td>
</tr>
<tr>
<td>Format</td>
<td>2 lecture, 1 section</td>
<td>Daily lecture</td>
<td>On-line</td>
</tr>
<tr>
<td>Exams</td>
<td>4 in-class</td>
<td>3 in-class</td>
<td>5 on-line</td>
</tr>
<tr>
<td></td>
<td>1 on-line</td>
<td>2 on-line</td>
<td></td>
</tr>
<tr>
<td>Chapters Covered</td>
<td>17</td>
<td>17</td>
<td>15</td>
</tr>
<tr>
<td>Other Assignments</td>
<td></td>
<td></td>
<td>8 Writing Assignments Review Quizzes On-line Flash Cards</td>
</tr>
<tr>
<td>Enrollment</td>
<td>310</td>
<td>50</td>
<td>45</td>
</tr>
<tr>
<td>Common Elements</td>
<td>E-text, On-line Resources, Exam Content, Pre-Tests</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The semester version of the class enrolls about 300-350 students, and is taught in a two lecture, one section format. When taught in the 4-week summer session in lecture format, the class meets for two and a half hours per day and enrolls about 50 students. The on-line class was also taught in a 4-week summer session, with daily work plans, on-line resources such as practice quizzes linked to the text and definitional flash cards, additional writing and

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2 The formal course goals (arrived jointly by faculty who teach the class) are listed in Appendix 1.

3 The size of the class is limited by classroom space (we use the largest lecture hall on campus, Woodburn 100, capacity 430) and available AIs (each teaches 2 sections, which are typically capped by room capacity at about 30 students).
exam prep assignments, and frequent chat sessions with the instructor and an associate instructor.

The text for the classes is *American Politics Today*, which I coauthor and is in its 3rd edition, and is assigned for the classes as an e-text on Courseroad. The text brings with it an extensive text bank, and on-line resources including exam prep exercised and videos. These resources are the foundation of the implementation of the on-line class; they also facilitate the comparative assessment of student performance across the three classes. The on-line class covered slightly fewer chapters/topics – 15 rather than the full 17 in the semester and summer class.

The test bank was also used to generate a measure of baseline information: at the beginning of each chapter, students would take an ungraded pretest comprised of multiple-choice questions from the chapter’s test bank. This pretest provided a measure of the student’s baseline knowledge – what they knew about the topic before being exposed to readings, lectures, and other instructional content. Exams for the classes were a combination of 30 multiple-choice questions and short essays (students were given 3 questions and must write on two).

The presentation of the exams varied. In the semester class, four exams were conducted in-class class, while one was an on-line open-book, timed exam taken through Oncourse. During the summer class, two exams were in-class and three were on-line. All of the on-line exams were taken on-line. Apart from these differences, the exams were identical – in particular, for each portion of the class, exams for the semester, summer, and on-line class all had the same 30 multiple choice questions.

**Assessing Student Performance: A Field Experiment**

The “data” from this experiment consists of exam scores – the unit of analysis is a student’s score (out of 100) on one of the multiple-choice exam sections. In all, across the three classes already taught and the two upcoming, I will have over 4000 observations, each a single student’s performance on a given exam in a particular class.

The preliminary analysis of this data from the three classes taught in 2013 was accomplished using a multiple regression, where the dependent variable is a student’s score on a particular exam. The following independent or explanatory variables were used:

- Whether the exam was the first one in the class

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5 The structure of this class reflects the instructor’s participation in a CITL Workshop in Summer 2011.

6 The analysis presented here focuses on the multiple choice questions, as I was unable to secure the same AIs for the summer classes, thus if there was some difference in scores, it would be difficult to determine whether the differences were real or an artifact of new graders. Part of the work proposed here is to extend the analysis to the short essay questions.

7 For 2 exams in the on-line class, the set of questions were slightly different because the section of the class covered 1 less chapter – in any case, they were randomly selected from the test bank.

8 Full details of the analysis are omitted due to the space limitation of this proposal. I would be happy to provide any additional information on request.
• Whether the exam was the final exam in the class
• Whether the exam was conducted on-line or in-class
• Whether the class was taught during the semester or in the summer
• Whether the class was taught on-line or face-to-face
• The number of chapters students were responsible for on the exam
• Student effort, measured using the percentage of completed pretests and assignments
• Baseline knowledge, measured using the pre-tests

Using the regression parameters, I calculated the predicted change in student exam performance as a function of these different explanatory variables. The figure below shows the direction and magnitude of these predicted changes, expressed as a percentage of the baseline exam score.

Some of these predicted changes are not surprising – students who enter the class knowing more do better; students who fail to turn in assignments do worse. Allowing an open-book timed exam increases scores by about 10%. Performance is slightly worse on final exams, presumably given the press of other work. The largest negative effect is performance on the first exam, a point that will be addressed in the design of the upcoming classes.

The surprising finding of the analysis is that exam performance in on-line classes is significantly worse than in the other class types – about 10% worse, one of the larger negative effects. In other words, controlling for other factors, students in these classes appear to be learning less than their counterparts in standard face-to-face classes.

Moving Forward: Plan of Work

As the figure shows, students in the on-line class lag in terms of their exam performance. The question is, does this gap reflect something about the design of the class or is it a
function of some extraneous factor that is currently not accounted for in the analysis? Are the same differences apparent in essay grades? Can a different instructional format or course design for the on-line class reduce the gap in achievement?

In particular, one factor that the above analysis does not consider is a student's GPA and class standing. In particular, it appears that the first implementation of the on-line class attracted many graduating seniors who need one additional class to fulfill credit hour or degree requirements. It is possible, then, that the observed (negative) difference between the classes may reflect the characteristics of the student body rather than the method of instruction. To address this question, I will have research assistants add information on class standing and GPA into the analysis dataset, and include these variables in my subsequent analysis.

The second and third pieces of new analysis will build on my second round of teaching two versions of the intro class. In particular, I will structure my Spring 2014 class so that a smaller group of two AIs grades all of the essays for two of the exams. The same AIs will grade the same questions in the summer on-line class using the same rubric, allowing a direct comparison of educational outcomes on this section of the test.

Finally, in consultation with CITL staff, I will revise the course structure of the on-line class with the goal of increasing student performance in Summer 2014. One possibility suggested by evaluations is that students want additional opportunities to ask direct questions to the course instructor, using a mechanism such as weekly Google+ hangouts. The augmented analysis will test whether these changes have any effect.

**Budget**

I request a total of $2000. Of these funds, $600 will be used to pay graduate students (15/hour, 40 hours) to add student information to the analysis dataset, and $900 (15/hour, 2 graders, 30 hours each) will be used to pay graders. The remaining $500 will be use to partially defray my travel expenses to the 2014 annual meeting of the American Political Science Association Annual Meetings, where I will present the results of the augmented analysis.

**Dissemination of Results**

As part of discussions with my Department Head and representatives from the Dean’s Office over summer course scheduling, I have agreed to prepare a written report and public presentation at IU on the findings of this research. I am also committed to presenting the results at my association’s annual meeting, and publishing the results in a disciplinary journal. Beyond that, I would be happy to participate in CITL events.

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9 The same might be true for some students in the other two classes, but preliminary work suggests the percentages are much smaller.  
10 Publication of findings based on this analysis will require Human Subject approval. I have spoken to IRB staff and securing this approval with appropriate safeguards should not be a problem.
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Education

M.A. Political Science, University of Rochester, 1986.


Academic Experience
2006-Present: Professor, Department of Political Science, Indiana University. Affiliated faculty, Ostrom Workshop, Russian Eastern European Institute.

2011-2012, Fulbright Senior Scholar, Higher School of Economics, Moscow, Russia.

1998-1999: Visiting Associate Professor, Department of Government, Harvard University.

1996-2006: Associate Professor, Department of Political Science, The Pennsylvania State University.
1994-1996: Associate Professor, Department of Political Science, Duke University.
(Assistant Professor, 1987-1994)


Summer 1988: Instructor, ICPSR Summer Training Program, University of Michigan

Publications

Books


Edited Volumes


Articles

Explaining Transitional Representation: The Rise and Fall of Women of Russia (with Christopher Kam, Itai Sened, and Regina Smyth), *Journal of East European and Asian Studies*, February 2011

Parliaments, Cabinets, and Uncovered Sets (with Chris Kam, Itai Sened, and Regina Smyth), *American Political Science Review*, May 2010

The Impact of State Legislative Term Limits on The Competitiveness of Congressional Elections (with Nate Birkhead and Gabriel Uriarte), *American Politics Research*, Fall 2010


The Uncovered Set and the Limits of Legislative Action (with Itai Sened and Ivan Jeliaskov). *Political Analysis*, Summer 2004.


Book Chapters


Popular Writing


The Utility of Self-Governance: Elinor Ostrom’s Contributions to Knowledge (with Regina Smyth), *Transnational Corporations Review*, June 2010

Nobel Winner’s Work Challenges LI on Consolidation (with Regina Smyth). *Newsday*, November 27, 2009


**Courses Taught**

Introduction to American Politics (undergraduate, undergraduate honors)
American Core (graduate)

Legislative Politics (undergraduate and graduate)
Political Parties (undergraduate)

Introductory Methods (undergraduate and graduate)
Econometrics (graduate)
Advanced Statistics (graduate)

Strategy of Politics (undergraduate)
Introduction to Positive Theory (graduate)
Game Theory (graduate)
Political Institutions (graduate, various versions)

Senior Honors Thesis (undergraduate)
Research Practicum (graduate)
Intro American Government Course Goals

Substantive:

1. By the end of the course, students should be able to understand the process of American politics, including the following:
   a. who the relevant actors are in contemporary American politics,
   b. what the sources of conflict are and what is at stake for those actors in resolving those conflicts,
   c. how citizens and politicians pursue their goals in light of their differences, why compromise is often necessary for policy change, and what factors make compromise more or less likely.
   d. how the rules that determine how decisions are made in government have their own independent impact on outcomes. Moreover, students will learn how the ability to determine political rules empowers the people who make those choices.

2. Students will have a detailed understanding of the basic structure and laws that define American’s national government and politics, as well as contemporary issues and debates in American politics.

3. Students will be able to cite examples of how political science research provides insight into why things happen as they do in American elections and in the policy-making process in Washington.

Skill-based:

1. Students will be able to write coherent short essays that identify and explain the significance of the key terms drawn from the readings and lectures.

2. Students will be able to identify the steps of critical thinking and effectively apply those steps to both contemporary and historical selections on American politics.
October 18, 2013

Dear Selection Committee,

I write in support of Professor William Bianco’s application for a $2,000 Scholarship of Teaching and Learning Grant from the Center for Innovative Teaching and Learning for “Assessing Educational Outcomes in an On-Line Class.” The class in question is Y103 Introduction to American Politics, a survey course that is taught every semester in large lecture format. Professor Bianco regularly teaches Y103 to more than 300 students, and he is the co-author of one of the nation’s leading college textbooks on this subject. He knows his stuff, and he continually experiments with different modes of presentation material to students.

In fact, Professor Bianco developed an online version of Y103 last spring, which he offered for the first time in summer session. He offered the same course on campus, for the purpose of comparing learning outcomes in the two different formats. The preliminary results of this experiment indicate that students learned more in the “live” course on campus than those who took the course online. I say “preliminary” because it necessary to introduce controls for students’ class standing and GPA, as these may have affected students’ choice of format.

To determine if differences in learning outcomes for Y103 are primarily the result of student backgrounds, instead of the course format, Professor Bianco is requesting funds to employ research assistants who can add student background information to the dataset on learning outcomes. In and of itself, this would be a very useful extension of last summer’s experience. It would provide us with real empirical leverage on the important question of whether students learn as well in online courses as they do in real time instructional settings.

At the same time Professor Bianco is proposing to re-run the experiment, teaching Y103 in large lecture format on campus in spring, 2014. He would also teach Y103 online in summer, 2014, modifying the course to mimic features of the live version that students seem to want the online version. In effect, Professor Bianco wants to see if a hybrid format can generate learning outcomes equivalent to live versions of Y103. This would be consistent with other research, although this has not been tested locally in political science. If we discover that a hybrid version of Y103 is effective, we will certainly deploy it more frequently and study ways of making it even more efficacious.
Professor Bianco is seeking a modest amount of money for a project with potentially large payoffs, not only for the Department of Political Science, but for the campus as a whole. His course, and more importantly, his approach to developing an online course, could become a model for instructors of the many other large survey courses that are taught at IUB. It could also become a model for the discipline of political science, since Professor Bianco intends to share the results of his experiment at a national meeting of approximately 8,000 political scientists.

Given Professor Bianco’s expertise, track record, and careful planning we have every reason to anticipate a successful outcome of this experiment. I urge you to support his proposal, and if I can be of any further assistance to his application, please do not hesitate to contact me at hansonr@indiana.edu.

Sincerely,

Russell L. Hanson
Professor & Chair
Department of Political Science
Indiana University Bloomington